EFFECT OF SEA WEED, SEA GRASS AND POWDERED ALGAE IN REARING THE HATCHERY PRODUCED JUVENILES OF *HOLOTHURIA* (METRIATYLA) *SCABRA*, JAEGER

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ABSTRACT

Holothuria scabra juveniles (>20mm) produced in the hatchery were provided with powdered *Sargassum* and *Cymodocea* with three different sediments like fine sand, coral sand and mud at a proportion of 3: 17 in an experiment for 22days. In another experiment, powdered algae *Spirulina* was used in varying proportion with fine sand and *Sargassum* powder for 30 days. The one way ANOVA showed significant difference in growth in weight of the juveniles fed with *Sargassum* and *Cymodocea* combinations. Maximum growth rate suggested the suitability of *Sargassum* with fine sand or with coral sand. No significant difference was observed in the growth in length and weight of the juveniles fed with varying proportions of *Spirulina*, but significant difference was observed in the weight of juveniles fed with 2% *Algamac* indicated that *Algamac* can be supplemented along with the feed.

INTRODUCTION

The sea cucumbers popularly called holothurians form a valuable and traditional fishery in many South Pacific and Asian countries. Due to high demand of the beche-de-mer in Southeast Asian countries, the sea cucumbers are being over fished and the natural stock is getting depleted.

The beche-de-mer industry was introduced by the Chinese in India, more than 1000 years ago. It is essentially a cottage industry and requires little investment. During 1996-97, India exported 70 metric tonnes, worth of Rs.1.04 crore of beche-de-mer, which has decreased to 3.81 metric tonnes during 2001. As evidenced from the declining catch and export trend, the Ministry of Environment and Forest, Govt of India, imposed a ban in 2001 on the capture of sea cucumbers, under the Wild Life Protection Act.

The release of hatchery produced juveniles to their natural habitat, suggested as a measure of restoration of depleted population is being called restocking or reseeding (Battaglene, 1999; Bruckner *et al.*, 2003). Because of high value and wide distribution, *Holothuria scabra* can be considered as an ideal species for stock enhancement programme. (Conand, 1990; James 1994; Battaglene *et al.*, 1999). James and James (1994) and Battaglene (1999) reported that in the hatchery, juveniles of *H.scabra*

ranging from 10 to 20 mm can be transferred to sandy substrata for further rearing. The present study was conducted to understand the effectiveness of sea weed, sea grass and powdered algal combinations with three sediments like mud, fine sand and fine coral sand in rearing the hatchery produced juveniles of *H.scabra,* thereby to develop a simple and cost effective method for mass rearing of juveniles.

MATERIALS AND METHODS

Juveniles of *H.scabra* of varying size groups (22.43mm and 0.640.05g), (36.35.1mm and 2.480.6g) were reared at a rate of 1/litre in 3l plastic aquarium bowls for the I and II experiment respectively with sand filtered seawater. The water was changed daily and feed was given at a rate of 10% of the mean initial body weight of the juveniles.

The feed for the I experiment was constituted by combination of powdered sea weed *Sargassum* and sea grass *Cymodocea* with three different sediments like fine sand, crushed coral sand and mud at a proportion of 3:17 for 22 days. In the second experiment, 85% was made with fine sand and the remaining 15% with blue green algae, *Spirulina* powder of varying percentage (1-4) and the balance being made up with *Sargassum* powder for 30 days. *Spirulina* powder was not provided to the control. Instead of 2% *Spirulina*, 2% *Algamac* 2000 (dried *Schizochytrium* (Bio Marine, Hawthrone, CA) was given to one set of juveniles for comparison. All the feed ingredients were uniformly sieved through 200µm sieve.

For each concentration of feed provided, triplicates were maintained. The body length was measured after complete relaxation and the wet weight was taken after drying them on tissue paper at the end of the experiment. The mean differences in length and wet weight were used for one way analysis of variance (ANOVA). The differences among treatments were tested for significance by a post hoc multiple comparison (Fisher's LSD) test.

RESULTS

In the first experiment, on 22nd day, the juveniles fed with the combination of fine sand with *Sargassum* registered the highest mean absolute growth rate of $0.67\pm0.2mm^{-1}$ day in length and $0.054\pm0.009g^{-1}$day in weight followed by $0.32\pm0.06mm^{-1}$day and $0.053\pm0.02g^{-1}$day in coral sand with *Sargassum*,

0.28±0.2mm^{-1}day in length in mud with *Sargassum*, 0.026±0.009g^{-1}day in weight in coral sand with *Cymodocea*, 0.24±0.14 mm^{-1}day in coral sand with *Cymodocea*, 0.02±0.004 g^{-1}day in fine sand with *Cymodocea*, 0.2±0.006 mm^{-1}day in mud with *Cymodocea*, 0.017±0.009g^{-1}day in mud with *Sargassum* respectively. The juveniles given with fine sand and *Cymodocea* and mud with *Cymodocea* registered growth in length and weight at 0.19± 0.09mm^{-1}day and 0.016 ±0.008g^{-1}day respectively

The one way ANOVA on the mean increase in the length on various combination indicated no significance. But significant difference ($P<0.01$) was observed between the mean weight increase (Table 1). In the multiple comparison also, high significant difference was observed in the mean weight increase between *Sargassum* with fine sand and *Sargassum* with mud, *Sargassum* with fine sand and *Cymodocea* with fine sand, *Sargassum* with fine sand and *Cymodocea* with mud, *Sargassum* with fine sand *Cymodocea* with coral sand, *Sargassum* with mud and *Sargassum* with coral sand, *Sargassum* with coral sand *Cymodocea* with fine sand, *Sargassum* with coral sand and *Cymodocea* with mud, *Sargassum* with coral sand and *Cymodocea* with coral sand. *In* the second experiment on the 30th day, the juveniles fed with 1% *Spirulina* registered the maximum mean absolute growth rate in length of 0.17 ± 0.09mm^{-1}day followed by 0.15 ± 0.09mm^{-1}day with 3%, 0.138±0.09mm^{-1} day with 2% *Algamac*, 0.1 ± 0.04mm^{-1}day with 2%, 0.06±0.01mm^{-1}day with the control. The juveniles fed with 2% *Algamac* registered the maximum mean absolute growth in weight of 0.062±0.03g^{-1}day followed by 0.034±0.006g^{-1}day with control, 0.03±0.003g^{-1}day with 3%, 0.024±0.004g^{-1}day with 1%, 0.018±0.008g^{-1}day with 2%. The juveniles fed with 4% *Spirulina* showed the least growth rate in both length and weight of 0.03±0.016mm^{-1}day and 0.018±0.010g^{-1}day respectively . No significant difference was observed in the mean growth in length and weight of the juveniles fed with varying proportion of *Spirulina* and between mean growth in length of 2% *Spirulina* and 2% *Algamac*, but significant difference ($P<0.01$) was observed between the mean weight increase of the juveniles fed with 2% *Algamac* and 2% *Spirulina* (Table 2).

DISCUSSION

In the present study, 100% survival was noticed among *H scabra* juveniles (>20mm) reared. Similarly Ito (1995), James (1996) and Bataglene *et al.* (1999) reported high survival rate ranging from 93.3 to 100% among the juveniles of *Stichopus japonicus* and *H. scabra* respectively in the laboratory condition. The marginal increase in length of the juveniles fed with various feed ranged from 0.2 to 0.6mm^{-1}day. Similarly Battaglene *et al.* (1999) also observed 0.2 0.86mm^{-1}day for H.scabra juveniles. The mean growth in weight of the juveniles, when fed with combination of fine sand with Sargassum and Algamac was 0.054, 0.0626g^{-1}day respectively which was much less than that of 0.15 to 0.2 g^{-1}day, observed for H.scabra juveniles as reported by James *et al.* (1996) and Battaglene *et al.* (1999).

The highest growth rate of *H.scabra* juveniles observed when fed with combination of fine sand with *Sargassum*, coral sand with *Sargassum* inferred that *H.scabra* juveniles (>20mm) preferred either fine sand or fine coral sand as the bottom substratum along with *Sargassum.* Such differences in the preferences for particle size were recorded with increasing body size in some holothurian species due to habitat change (Hammond, 1982.,Yingst, 1982 and Wiedemeyer, 1992). The enhanced growth rate of the juveniles observed when fed with *Sargassum* might be due to the presence of growth promoters as observed by Ramofafia *et al.* (1997) in *Actinoapyga mauritiana* juveniles that fed with the leaves of sea weed *Lyngbya majuscula.*

Though the adult *H.scabra* prefers muddy sand areas with *Cymodocea* bed, as reported by James (1994), the present work indicated that the condition is not suitable for the juveniles but the leaves could act as a suitable settlement surface for the penactula as indicated by Mercier *et al.* (2000) with the sea grass leaves of *Thalassia* sp, and *Enhalus* sp. in Solomon Islands. The blue green alga *Spirulina* could not influenced the juvenile growth, whereas the dried *Schizochyritium* could be supplemented as a protein source, in the feed for the juvenile *H.scabra*, as suggested by Battaglene *et al.* (1999).

In future, studies on the particle size selectivity by juvenile *H.scabra* of various size classes, the nutritive value of various epiphytic algae and their associated diatoms and bacterial flora have to be given more importance.

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